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March 16, 1987

Mr. Brad Bradley
Remedial Project Manager (5 HE-12)
USEPA Region V CERCLA Enforcement Section
230 South Dearborn Street
Chicago, Illinois 60604

RE: Johns-Manville Waukegan Disposal Area
Addendum to Final Feasibility Study Report (December 1986)

Dear Mr. Bradley:

In response to your special notice letter of January 17, 1987 we are proposing the following remedial alternative under the provisions of Section 122(e). This alternative is a variation of the "Soil Covering with Vegetation" remedial alternative discussed in the above referenced Final Feasibility Study Report. This variation would consist of a total soil cover thickness of 21" with 9" to 12" thick beach sand underneath the silty clay layer on all flat surfaces. This alternative would provide similar protection against upmigration of asbestos from freeze/thaw effects (upfreeze) as provided by the 24" soil cover profile proposed in the above referenced addendum.

The enclosed discussion of the proposed remedial alternative highlights where it differs from the primary "Soil Covering with Vegetation" alternative and refers to the December 1986 FS Report for its detailed discussion. In addition, I am enclosing a copy of the calculations provided by Golder Associates dated February 4, 1987 for the 21" layer.

Please feel free to contact me if you need additional information.

Sincerely yours,

Marvin Clumpus, P.E.
Project Coordinator

cc: S. K. Malhotra, Ph.D., P.E.
Site Project Manager

John Zackrison
Kirkland & Ellis

PROPOSED VARIATION
OF
SOIL COVERING WITH VEGETATION
REMEDIAL ALTERNATIVE

ALTERNATIVE DESCRIPTION:

This alternative involves grading of waste materials/soil, covering with a minimum of 21" thick compacted non-asbestos-containing soil and growing and maintaining a cover of vegetation on the inactive disposal area. The three active waste disposal areas (sludge disposal pit, asbestos disposal pit and miscellaneous disposal pit) would continue to be used for current and future waste disposal. Written waste handling procedures would be provided to the staff working at the site for asbestos disposal pit, the miscellaneous disposal pit, and the sludge disposal pit. However, the asbestos disposal pit would be closed in 1989 and any asbestos-containing material generated after closure would be disposed off-site in an approved landfill.

1.0 SCOPE OF WORK

Activities to be accomplished under this alternative would consist of the following:

- Site preparation and set-up
- Clearing and grubbing and miscellaneous site work
- Grading wastes
- Soil covering and compacting
- Placing riprap on settling-basins slopes and gravel on dike-roadways.
- Placing top-soil and constructing drainage ditches
- Revegetation with grasses and shrubs
- Support Services
- Monitoring and reporting of surface water and groundwater quality

Descriptions of the actions to be taken during each of the above identified activities except soil covering and compacting are presented in Sections 4.2.1.1 through 4.2.1.8 of December, 1986 Feasibility Study Report. Descriptions of actions to be taken under soil covering and compacting are presented in the following paragraph.

1.0.1 SOIL COVERING AND COMPACTING

The graded materials/soil would be covered with a minimum of 18" of compacted non-asbestos-containing soil. Areas on the southwest and northeast corners of the site would also be provided with soil cover. The 18" cover soil, on the horizontal surfaces, would consist of two layers of different types of soils. The first layer would be 9" to 12" thick of non-asbestos-containing beach sand obtained from the 40-acre parcel of land located in the northwest corner of the Johns-Manville Waukegan Plant property and the second layer would be 6" to 9" thick of non-asbestos-containing borrow silty clay soil from the Waukegan area. The 18" cover soil on the dike slopes would consist of non-asbestos-containing borrow silty clay soil only. A top soil cover of 3" would be placed over the compacted 18" thick soil cover and would provide added cover thickness and suitable soil for quick growth of grasses.

1.1 ALTERNATIVE ANALYSIS

The relative desirability scores for this variation for its technical feasibility, compliance with institutional and public health requirements, for its environmental impacts and capital and operation and maintenance costs are more or less the same as for the 24" thick cover thickness variation of the soil covering with vegetation alternative discussed in Section 5.0 of December 1986 FS Report. The estimated costs of this variation are as follows:

Capital cost of the primary alternative (Appendix A, page A-5 of 1986 FS Report for 18" thick Cover)	$3,624,170
Added Construction cost due to sand layer on the horizontal surfaces and 3" additional cover soil thickness	$162,500
Added Construction Management Cost	20,000
Added Contingencies	18,250
Added Cost sub-total	$200,750
Total Capital Cost	$3,824,920
Present Worth of Capital Cost	$3,824,920
Estimated O&M Cost (same as for soil covering with vegetation alternative presented in Appendix A page A-5 of December 1986 FS Report)	$ 49,000
Present worth of O&M Cost	461,920
Total Present Worth (Capital & O & M Costs)	$4,286,840

The analysis of the proposed alternative is similar to the one presented in Section 6.2, Item 3, page 6-4 under Soil Covering with Vegetation alternative. A summary of this analysis is presented in the following paragraphs.

This alternative involves appropriate treatment and disposal technologies that meet CERCLA and NESHAP requirements and provides adequate protection against UPFREEZE (upmigration of asbestos through soil cover by freeze/thaw). In addition, provisions of SARA have been considered and a monitoring program for the soil cover, to be mutually agreed upon by USEPA and Manville, will be developed to attain the new cleanup standards contained in Section 121 of SARA.

This alternative involves shorter implementation time as well as lesser commitment of energy, money and other resources compared to on-site or off-site landfilling alternatives. No special studies or permits or approvals are needed for its implementation and no off-site disposal or temporary storage of contaminated waste is required. This alternative also provides some protection to groundwater from potential contamination by leachable lead and includes groundwater monitoring. However, the groundwater contamination is not of primary concern at this site because of the presence of lead in its encapsulated and not readily leachable forms.

It has less adverse public health and environmental impacts during implementation than on-site and off-site landfilling alternatives and is estimated to benefit the landscape and wildlife around the disposal area.

The adverse impacts on public health and environment that may occur during implementation are due to increased level of airborne asbestos, dust and noise pollution. However, these adverse impacts will be mitigated through limiting access to active construction area, wetting the active construction area prior to grading and waste handling, monitoring workers for exposure to airborne asbestos and using Level C protection (use of respirators, coveralls, gloves, foot and head covering) during grading and waste handling.

This alternative has relatively low operation and maintenance requirements. The current Manville O & M Staff is somewhat familiar with the O & M requirements of soil covering with vegetation alternative. Groundwater and surface water sampling and analysis will be performed by independent consultant. The Manville staff is capable of maintaining vegetation (grasses and shrubs) proposed under this alternative.

Soil covering with vegetation alternative using a total of 21" thick cover is therefore recommended for remedial action at this site. It is estimated to have a Capital cost of $3,824,920 and an annual O & M cost of $49,000. The preliminary implementation schedule presented in Table 6-2 of the December 1986 FS Report would be modified and the recommended remedial alternative is estimated to be implemented by the end of 1989.

Golder Associates
CONSULTING GEOTECHNICAL AND MINING ENGINEERS

February 4, 1987 Our ref: 863-2041

Manville Service Corporation
Mail Stop 3-25
12999 Dear Creek Canyon Road
Littleton, CO 80127

ATTENTION: Mr. Marvin Clumpus, P.E., Senior Engineer

RE: UPFREEZING ANALYSIS--TWO-LAYER, 21-INCH COVER
WAUKEGAN, ILLINOIS PLANT WASTE DISPOSAL AREA

Dear Mr. Clumpus:

Ref: Golder Associates December 19, 1986 Letter to Manville Service Corporation, "Updated Upfreezing Cover Thickness Analysis -- Using McGaw (EPA) Thermal (Lambda, N, K) Values..." and including attached UPFREEZ5Y results, dated 12-18-86

This extends the upfreezing analysis results in the referenced December 19 letter in answer to your question regarding the upfreezing performance and R100 estimate for a two-layer, 21-inch cover described as follows:

Upper Layer: 12 inches of silty clay, identical to the cover soil assumed in the December 19 letter, and having S = 30% and F = 0.3;

Lower Layer: 9 inches of sand, presumably NFS (non-frost-susceptible) but having S = 10% and F = 0.3.

R100 is the estimated probability (reliability) that upfreezing of "critically sized" (i.e., $X - A \leq 0.3$ ft) asbestos particles initially at the worst-case location (top of waste pile or bottom of cover) will take 100 years or longer. Cover upfreezing performance, including R100, was assessed based on thermal and upfreezing analysis, described as follows.

Cover Thermal Analysis

The December 19 results (including UPFREEZ5Y output) show the estimated thermal capacity of the upper 12-inch silty clay layer (S=30%) to be 667 F-Degree Days ± 14%. The estimated partial freezing index of the sand layer is about 640 F-Degree Days, assuming an unfrozen dry density of 110 pcf, S=10%, and thermal property relationships consistent with those in UPFREEZ5Y.

Therefore, the assumed 21-inch two-layer cover has a total thermal capacity of about 1,310 F-Degree Days. This is thermally equivalent to a 1.4-ft (17-inch) one-layer silty clay cover, which the UPFREEZ5Y output shows to have an estimated thermal capacity of 1308 F-Degree Days and an expected (average) return period of nine (9) years for complete freezing of the cover.

R100 (100-Year Reliability) Estimate

R100 for the assumed two-layer, 21-inch cover is 100%. That is, with the assumed S and F values, the absolute lower bound (ABD in UPFREEZ5Y) for upfreezing of critically sized particles exceeds 100 years, and, in fact, exceeds 120 years (83 or more years in the sand then 37 years in the silty clay). Based on comparison with 12-18-86 UPFREEZ5Y results: (1) the absolute lower bound is closer to 162 years (about 125 years through the sand then 37 years through the silty clay), and (2) the average or expected value for upfreezing (UP.YRS IN UPFREEZ5Y) would exceed 1,000 years. Regardless of the precise absolute lower bound estimate, for the assumed two-layer, 21-inch cover: R100 = 100%.

R100 estimates are conditional on strain (S) and heave fraction not recovered on thawing (F). Taken as a pair, the S and F values assumed or hypothesized for the cover are considered to conservatively and realistically support the R100 = 100% estimate. First, the assumed F=0.3 is considered conservative because empirical upfreezing studies show F to be of order 0.1 for vertical motion (August 25, 1986 personal communication from Prof. Bernard Hallet, Director of the Periglacial Laboratory at the University of Washington Quaternary Research Center). Second, the assumed S values for the two-layer cover are considered very conservative for this site, as discussed next.

Sand Layer-Related Upfreezing Characteristics

Visual inspection and limited sampling and grain-size testing indicate the natural clean sands found on site are medium to fine sand with less than one percent passing the No. 200 sieve, classified SP by the Unified Soil Classification System and NFS (non-frost-susceptible) by the U.S.A. Corps of Engineers frost design criteria. If, in fact, the cover sand layer is composed of these or similar sands, placed and

maintained uncontaminated by fines, then strain, S, will be less than 10%. Most likely S will be 3% or less, and very conceivably zero because freezing can drive water out of clean sands (in open systems) where drainage can occur.

At this site it is considered likely that drainage conditions below and laterally around the sands will allow drainage of freezing-expelled water from the (clean) sands because of the relatively slow advance of the freeze front in the sand layer (insulated below the 12 inches of silty clay). Therefore, provided adequate surface drainage is maintained to control ponding, an S=10% assumption for the sand layer is considered extremely conservative.

Further, the sand will reduce frost heaving in the silty clay due to moisture migration from below the silty clay (i.e., from the waste pile or the sand itself). The sand layer will also help provide (gravity) drainage to the silty clay. Therefore, a significant reduction in the strain (S) of the silty clay can be expected because of the sand. Under these circumstance an S=30% assumption for the silty clay is considered very conservative.

Conclusion

The assumed two-layer, 21-inch cover, actually implemented and maintained with good design (as assumed here), realistically and conservatively supports the R100=100% estimate and, for practical purposes, can be expected to stop upfreezing of critically sized particles.

Thank you for the opportunity to be of help. Please call if you need any clarification, elaboration, or further discussion.

Sincerely,

GOLDER ASSOCIATES

Charles L. Vita, P.E.
Senior Project Manager

CLV/cmw/034

cc: Brad Bradley, EPA (Region V, Chicago, IL)
Richard McGaw, (Hanover, NH)